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(71) Applicant  
Forest Fasteners Limited,  
Treforest Industrial  
Estate, Pontypridd, Mid.  
Glamorgan CF37 5YG,  
Wales

(72) Inventor  
David Oliver Jones

(74) Agent  
B. C. Robertson & A. B.  
Cundy

## (54) Wheel Nuts

(57) A wheel nut for vehicle wheels which are located by a central spigot, incorporates a captive seating washer (12) and part-spherical seating surfaces (16) and (17) between the

nut head (11) and washer (12) to allow the wheel nut to seat *via* its washer on a flat surface even in the event of a misaligned stud or a misaligned internal nut thread, without applying a bending load to the stud.

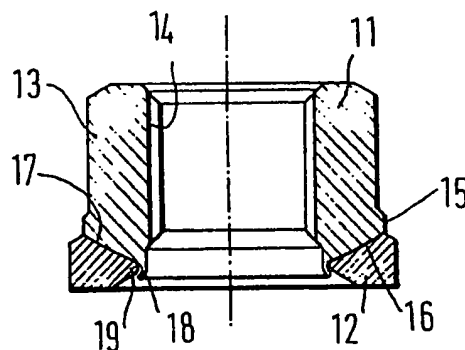


FIG. 1.

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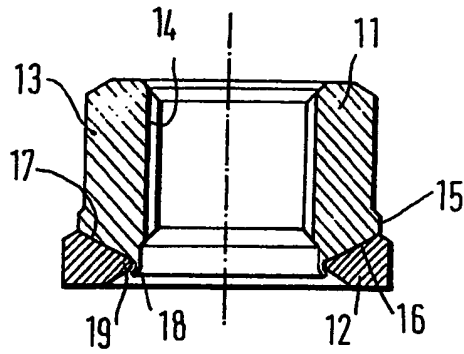


FIG. 1.

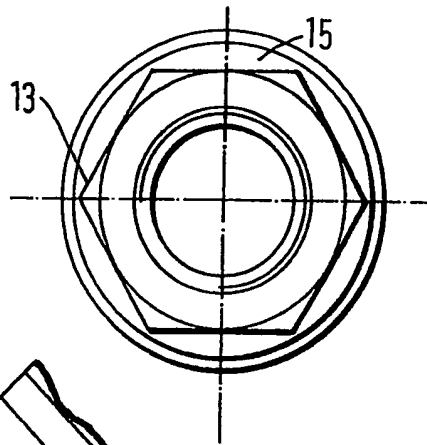


FIG. 2.

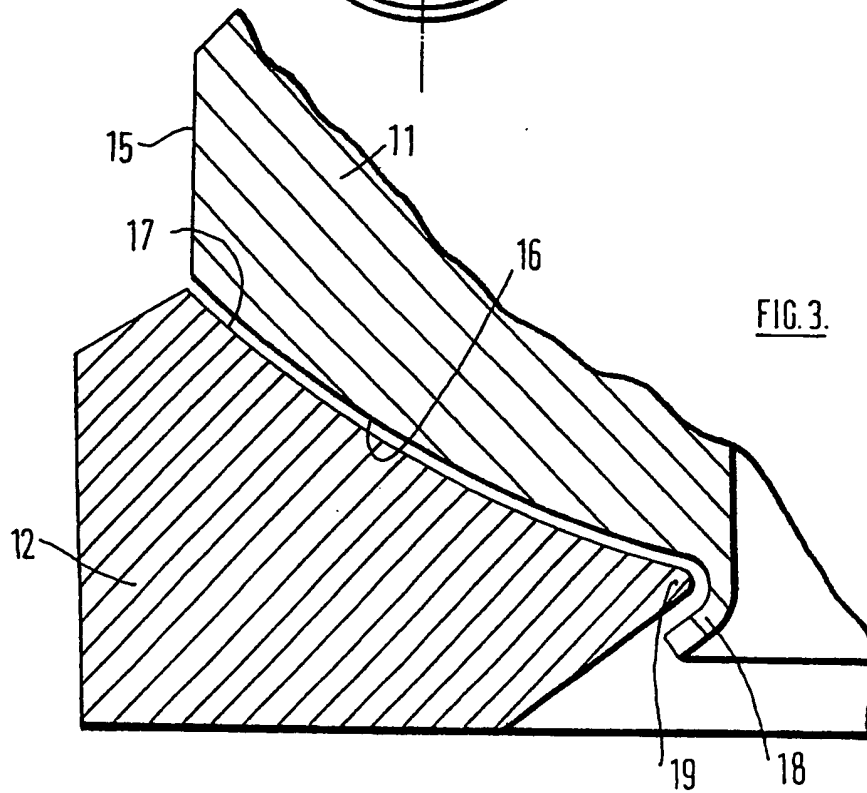


FIG. 3.

## SPECIFICATION

### Wheel Nuts

The invention relates to wheel nuts for securing vehicle wheels in position.

5 The traditional way of securing a vehicle wheel in its correct location in relation to a hub is to provide a conical seat around the wheel stud hole on the wheel and a corresponding seat on the abutment end of a nut so that as the nuts are  
10 tightened a wheel held by these nuts is automatically centred in relation to the studs. This arrangement can be entirely satisfactory on passenger cars and other small or light vehicles but the accuracy of wheel location can be  
15 inadequate for heavy commercial vehicles, particularly at high speed. In order to overcome this problem, it is becoming popular to locate a wheel centrally on its hub by means of a spligot or other carefully dimensioned and positioned  
20 interengagement between wheel and hub and then to use wheel studs and associated nuts merely to hold the wheel on to the hub and to transmit torque between the wheel and the hub.

However a problem can arise in connection  
25 with such studs and nuts because if the stud is axially misaligned or the screw thread on the nut is not accurately aligned with the seat of the nut, the tightening of the wheel nut can produce a bending load on the stud. This results in a  
30 dangerous stress concentration in a component which is subject to cyclically fluctuating loads as the wheel rotates so that it can be susceptible to fatigue failure.

According to the present invention a wheel nut  
35 comprising an internally threaded nut head and a captive seating washer is characterised by the provision of part-spherical seating surfaces between the nut head and the washer and some freedom for movement between the nut head and  
40 washer with the seating surfaces in mutual contact.

Preferably the seating surface on the nut head is convex and the seating surface on the washer is concave.

45 Preferably the nut has a hexagonal exterior portion and an enlarged collar adjacent the end of the nut which has a conical seat so that the seat extends out beyond the dimensions of the hexagon.

50 Preferably a sleeve extends axially from the nut head from within the seat, passes through the washer with a clearance and is turned out to hold the washer to the nut head with a clearance for relative radial movement.

55 An embodiment of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic cross section through a nut according to the present invention;

60 Figure 2 is a plan view of the nut shown in Figure 1; and

Figure 3 is an enlarged view of a part of Figure 1.

The wheel nut incorporates a nut head 11 and

65 a captive washer 12. The upper part of the nut head as shown is of conventional design and dimensions with a hexagonal outer surface 13 and an internal axial screw thread 14. The lower part of the nut head incorporates an integral  
70 outwardly extending collar 15. The major part of the bottom surface of the nut head has a part spherical seating surface 16 which extends outwardly beyond the dimensions of the hexagonal part of the nut by virtue of the collar  
75 15.

The washer 12 is of annular form and has a spherical upper seating surface 17 of the same radius as the spherical seat 16. The lower surface of washer 12 is flat for engagement with a flat  
80 wheel surface.

An integral sleeve 18 extends axially of the nut in a downward direction at a diameter which is clear of the screw thread 14 but is inward from the spherical seat 16. This sleeve passes through  
85 the central aperture of the washer 12 and is turned out to engage behind an inwardly directed rib 19 of the washer in order to render the washer 12 captive on the nut head 11. The rib 19 surrounds the sleeve 18 with a clearance so that  
90 some movement in a radial direction is possible between the nut head and the washer to allow one component to slide radially over the other in a generally radial direction with the spherical surfaces in mutual contact.

95 In use, when the nut has been produced with accurate alignment and concentricity between the screw thread 14 and the seat 16 and when the wheel stud to which the nut is to be secured is straight and perpendicular to the seating surface of the wheel, the wheel nut shown in the drawing  
100 can be tightened down to produce even loading around the periphery of the nut and avoid any bending load on the wheel stud. All of this is achieved whilst maintaining the nut head and the washer in accurate concentric alignment as  
105 shown. This is the same situation as would occur with a conventional nut. However, with a conventional nut and some misalignment, as the nut is tightened down the whole of the clamping load is taken at one edge of the nut, producing a bending load in the stud. In contrast, with the present invention, misalignment merely causes some movement between the spherical surfaces of the washer and nut to compensate for the  
110 misalignment and to result in a clamping load around the whole of the periphery of the nut and washer. Thus this arrangement prevents excessive bending loads and stress concentrations in the associated wheel stud and thereby provides a satisfactory wheel mounting.

### Claims

1. A wheel nut comprising an internally threaded nut head and a captive seating washer characterised by the provision of part-spherical seating surfaces between the nut head and the washer and some freedom of movement between the nut head and the washer with the seating surfaces in mutual contact.  
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2. A wheel nut as claimed in Claim 1 wherein the seating surface on the nut head is convex and the seating surface on the washer is concave.

- 5 3. A wheel nut as claimed in Claim 1 or Claim 2 wherein the nut has a hexagonal exterior portion and an enlarged collar adjacent the end of the nut which has a part spherical seat so that the seat extends out beyond the dimensions of the hexagon.

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4. A wheel nut as claimed in any preceding claim wherein a sleeve extends axially from the nut head from within the seat, passes through the washer with a clearance and is turned out to hold the washer to the nut head with a clearance for relative radial movement.

15

5. A wheel nut substantially as described with reference to and as illustrated by the accompanying drawings.